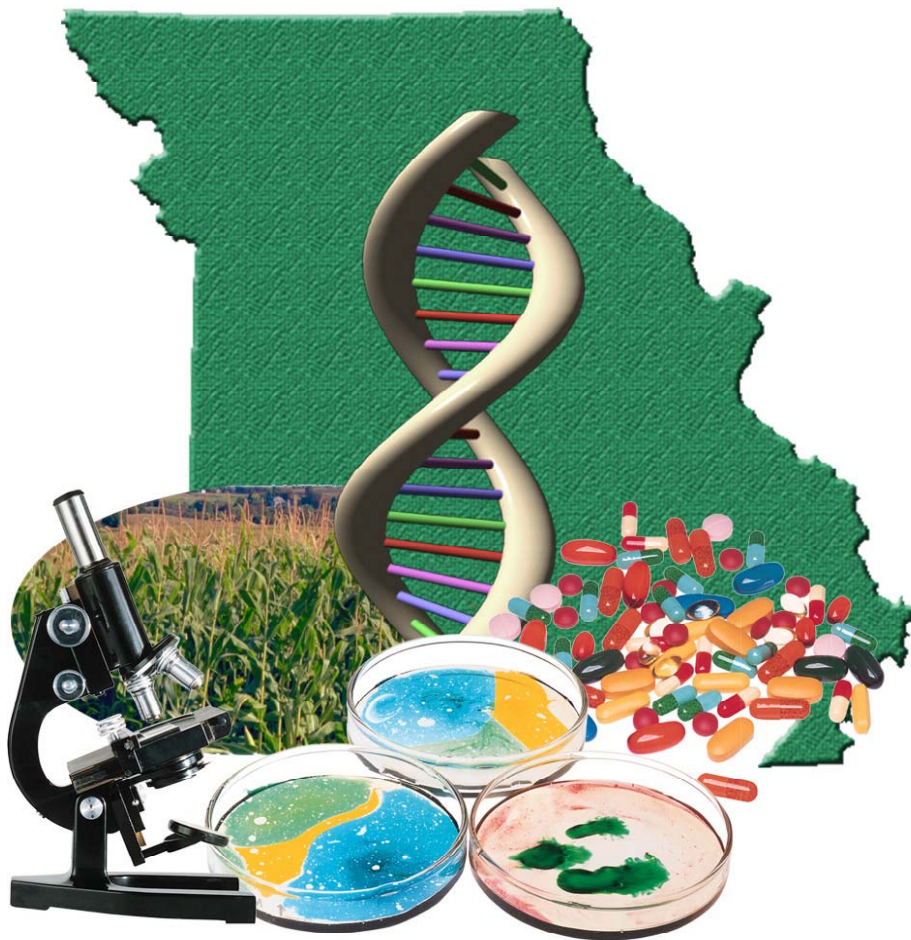


Life Science in Missouri

Industry Overview



February 2004



MISSOURI ECONOMIC RESEARCH & INFORMATION CENTER

Life Science in Missouri

- Life Science uses life-saving and life-enhancing technologies to improve the quality of life for people.
- Life Science is an important industry in Missouri, accounting for roughly 13% of the state's total economy.
- According to the Battelle Memorial Institute, to be a leading Life Science center Missouri must focus its efforts, investments, and initiatives in three key areas:
 - Supporting the development of Life Science companies;
 - Building Life Science research capacity;
 - Developing a workforce that will enable the Life Science sector to grow and succeed.
- Missouri's Life Science sector is defined using the North American Industry Classification System.
 - Through the first half of 2003 there were approximately 2,000 Life Science companies in Missouri.
 - These companies employed 6.79% of the state's total workforce.
 - The typical Life Science job pays 24% more than the statewide average wage.
- Missouri has a number of research assets on which to grow and build.
- Significant Life Science activity exists in every part of the state.

Life Science in Missouri

Table of Contents

| | |
|--------------------|-----------|
| Highlights | 1 |
| Definition | 3 |
| Importance | 8 |
| Employment | 11 |
| Trends | 15 |
| Innovation | 16 |
| Occupations | 20 |

Definition

What is Life Science?

Any branch of natural science dealing with the structure and behavior of living organisms.

Dictionary

Life-saving and life-enhancing technologies used to improve the quality of life for people everywhere.

Missouri Department of Economic Development

The use of the cellular and molecular processes to solve problems or make products. Included in this definition of the industry are firms that use cells and biological molecules for applications in medicine, agriculture and environmental management.

Biotechnology Industry Organization

Life Science is not only about research, though advances in new fields like genetics, proteomics, tissue engineering, and computational biology are opening up exciting, new economic opportunities. The growth of life science is also driven by the aging of the population, generating significant markets for new disease treatments and advanced medical services, as well as by continued population growth and the need for improved, high-yield food production.

Battelle Memorial Institute

How Do We Measure the Life Science Sector?

The North American Industry Classification System (NAICS) groups establishments into industries based on the activities in which they are primarily engaged. It is a comprehensive system covering the entire field of economic activities, producing and nonproducing. There are 20 sectors in NAICS and 1,170 industries in NAICS United States.

NAICS replaces the Standard Industrial Classification (SIC) System which first began in the 1930s.

The NAICS system has several principal advantages compared to the SIC system.

- *Relevancy.* NAICS is more relevant in today's economy. It identifies over 350 new industries and nine new service industry sectors.
- *Consistency.* NAICS uses a consistent classification principle. Businesses that use similar production processes are grouped together.
- *Comparability.* NAICS will be used by the United States, Canada and Mexico to produce comparable data.
- *Adaptability.* NAICS will be reviewed every 5 years, so classifications can keep pace with the changing economy.

| Sector | Name |
|--------|---|
| 11 | Agriculture, Forestry, Fishing & Hunting |
| 21 | Mining |
| 22 | Utilities |
| 23 | Construction |
| 31-33 | Manufacturing |
| 42 | Wholesale Trade |
| 44-45 | Retail Trade |
| 48-49 | Transportation & Warehousing |
| 51 | Information |
| 52 | Finance & Insurance |
| 53 | Real Estate, Rental & Leasing |
| 54 | Professional, Scientific, & Technical Services |
| 55 | Management of Companies & Enterprises |
| 56 | Administrative & Support, Waste Management & Remediation Services |
| 61 | Educational Services |
| 62 | Health Care & Social Assistance |
| 71 | Arts, Entertainment, & Recreation |
| 72 | Accommodation & Food Services |
| 81 | Other Services (Except Public Administration) |
| 92 | Public Administration |

No single NAICS sector covers the breadth of Life Science. Therefore, studies must use a compilation of industry codes to try and capture the industry. The following pages reflect the Battelle Memorial Institute definition of Life Science and corresponding NAICS conversion.

Battelle Memorial Institute Definition of Life Science, by SIC

| | SIC | | SIC |
|---|------|---|-----------|
| Food and Nutrition | | Medical Device and Instrument Manufacturing* | |
| Creamery butter | 2021 | Pharmaceutical machinery | 3559-9922 |
| Cheese, natural and processed | 2022 | Laboratory apparatus and furniture | 3821 |
| Dry, condensed, and evaporated dairy products | 2023 | Analytical instruments | 3826 |
| Ice cream and frozen desserts | 2024 | Surgical and medical instruments | 3841 |
| Fluid milk | 2026 | Surgical appliances and supplies | 3842 |
| Prepared feeds, NEC | 2048 | X-ray apparatus and tubes | 3844 |
| Cottonseed oil mills | 2074 | Electromedical equipment | 3845 |
| Soybean oil mills | 2075 | Hospitals and Laboratories* | |
| Vegetable oil mills, NEC | 2076 | General medical and surgical hospitals | 8062 |
| Animal and marine fats and oils | 2077 | Specialty hospitals, except psychiatric | 8069 |
| Edible fats and oils | 2079 | Medical laboratories | 8071 |
| Organic and Agricultural Chemicals* | | Life Science Research and Testing* | |
| Organic fibers, noncellulosic | 2824 | Commercial physical research, NEC† | 8731-0000 |
| Toilet preparations | 2844 | Biological research | 8731-01 |
| Industrial organic chemicals, NEC | 2869 | Commercial research laboratories† | 8731-0202 |
| Agricultural chemicals, non-fertilizer | 2879 | Commercial medical research | 8731-9902 |
| Drugs and Pharmaceuticals | | Commercial non-laboratory research services† | 8732-0108 |
| Medicinals and botanicals | 2833 | Noncommercial biological research organizations | 8733-01 |
| Pharmaceutical preparations | 2834 | Noncommercial research institutes† | 8733-9902 |
| Diagnostic substances | 2835 | Scientific research agencies† | 8733-9904 |
| Biological products except diagnostic | 2836 | Testing Laboratories† | 8734-0000 |
| | | Food testing services | 8734-9903 |
| | | Seed testing laboratories | 8734-9908 |
| | | Veterinary testing | 8734-9910 |

**NOTE: Certain additional Missouri establishments in unlisted SIC categories were selected for inclusion based on information from local sources. Beyond accounting for the inclusion of these additional Missouri establishments, similarly classified establishments are not added for the United States because of the lack of comparable local knowledge and input. Two establishments from 5191 (farm products wholesale) are added to Organic and Agricultural Chemicals, one from 2822 (synthetic rubber) and one from 3089-9913 (plastic and ID cards) are added to Medical Device and Instrument Manufacturing, one from 7363-9905 (medical help services) is added to Hospitals and Laboratories, and two establishments from 8732-0000 (commercial nonphysical research) and one establishment from 8734-0203 (product testing laboratories) are added to Life Science Research and Testing.*

†NOTE: These SIC categories are only partially included in the analysis, with life science establishments selected within Missouri based on industry and local information. United States figures for these SIC categories are estimated by applying the ratio of life-science-to-non-life-science calculated for Missouri.

Source: Battelle Memorial Institute, "Life Sciences & Missouri's Economic Future: An Opportunity to Build One Missouri", January 2003.

| SIC | SIC DESCRIPTION | NAICS | NAICS DESCRIPTION |
|------|---|--------|--|
| 2021 | Creamery Butter | 311512 | Creamery Butter Manufacturing |
| 2022 | Natural, Processed, And Imitation Cheese | 311513 | Cheese Manufacturing |
| 2023 | Dry, Condensed, And Evaporated Dairy Products | 311511 | Fluid Milk Manufacturing |
| | | 311514 | Dry, Condensed, and Evaporated Dairy Product Manufacturing |
| 2024 | Ice Cream And Frozen Desserts | 311520 | Ice Cream and Frozen Dessert Manufacturing |
| 2026 | Fluid Milk | 311511 | Fluid Milk Manufacturing |
| | | 311514 | Dry, Condensed, and Evaporated Dairy Product Manufacturing |
| 2048 | Prepared Feeds & Ingredients (no Dogs or Cats) | 311119 | Other Animal Food Manufacturing |
| 2074 | Cottonseed Oil Mills | 311223 | Other Oilseed Processing |
| | | 311225 | Fats and Oils Refining and Blending |
| 2075 | Soybean Oil Mills | 311222 | Soybean Processing |
| | | 311225 | Fats and Oils Refining and Blending |
| 2076 | Vegetable Oil Mills, Except Corn, Cottonseed, And Soybean | 311223 | Other Oilseed Processing |
| | | 311225 | Fats and Oils Refining and Blending |
| 2077 | Animal And Marine Fats And Oils | 311613 | Rendering and Meat Byproduct Processing |
| | | 311711 | Seafood Canning |
| | | 311712 | Fresh and Frozen Seafood Processing |
| 2079 | Shortening, Table Oils, Margarine, And Other Edible Fats And Oils | 311222 | Soybean Processing |
| | | 311223 | Other Oilseed Processing |
| | | 311225 | Fats and Oils Refining and Blending |
| 2824 | Manmade Organic Fibers, Except Cellulosic | 325222 | Noncellulosic Organic Fiber Manufacturing |
| 2833 | Medicinal Chemicals and Botanical Products | 325411 | Medicinal and Botanical Manufacturing |
| 2834 | Pharmaceutical Preparations | 325412 | Pharmaceutical Preparation Manufacturing |
| 2835 | In Vitro And In Vivo Diagnostic Substances | 325412 | Pharmaceutical Preparation Manufacturing |
| | | 325413 | In Vitro Diagnostic Substance Manufacturing |
| 2836 | Biological Products, Except Diagnostic Substances | 325414 | Biological Product (except Diagnostic) Manufacturing |
| 2844 | Perfumes, Cosmetics, And Other Toilet Preparations | 325611 | Soap and Other Detergent Manufacturing |
| | | 325620 | Toilet Preparation Manufacturing |
| 2869 | Industrial Organic Chemicals, Not Elsewhere Classified | 325110 | Petrochemical Manufacturing |
| | | 325120 | Industrial Gas Manufacturing |
| | | 325188 | All Other Basic Inorganic Chemical Manufacturing |
| | | 325192 | Cyclic Crude and Intermediate Manufacturing |
| | | 325193 | Ethyl Alcohol Manufacturing |
| | | 325199 | All Other Basic Organic Chemical Manufacturing |
| | | 325998 | All Other Miscellaneous Chemical Product and Preparation Manufacturing |

| SIC | SIC DESCRIPTION | NAICS | NAICS DESCRIPTION |
|------|---|--------|---|
| 2879 | Pesticides And Agricultural Chemicals, Not Elsewhere Classified | 325320 | Pesticide and Other Agricultural Chemical Manufacturing |
| 3559 | Special Industry Machinery | 333298 | All Other Industrial Machinery Manufacturing |
| | | 333319 | Other Commercial and Service Industry Machinery Manufacturing |
| 3821 | Laboratory Apparatus And Furniture | 339111 | Laboratory Apparatus and Furniture Manufacturing |
| 3826 | Laboratory Analytical Instruments | 334516 | Analytical Laboratory Instrument Manufacturing |
| 3841 | Surgical And Medical Instruments And Apparatus | 332994 | Small Arms Manufacturing |
| | | 339111 | Laboratory Apparatus and Furniture Manufacturing |
| | | 339112 | Surgical and Medical Instrument Manufacturing |
| 3842 | Orthopedic, Prosthetic, And Surgical Appliances And Supplies | 322291 | Sanitary Paper Manufacturing |
| | | 334510 | Electromedical and Electrotherapeutic Apparatus Manufacturing |
| | | 339113 | Surgical Appliance and Supplies Manufacturing |
| | | 339999 | All Other Miscellaneous Manufacturing |
| 3844 | X-ray Apparatus And Tubes And Related Irradiation Apparatus | 334517 | Irradiation Apparatus Manufacturing |
| 3845 | Electromedical And Electrotherapeutic Apparatus | 334510 | Electromedical and Electrotherapeutic Apparatus Manufacturing |
| | | 334517 | Irradiation Apparatus Manufacturing |
| 8062 | General Medical And Surgical Hospitals | 622110 | General Medical and Surgical Hospitals |
| 8069 | Specialty Hospitals, Except Psychiatric | 622110 | General Medical and Surgical Hospitals |
| | | 622210 | Psychiatric and Substance Abuse Hospitals |
| | | 622310 | Specialty (except Psychiatric and Substance Abuse) Hospitals |
| 8071 | Medical Laboratories | 621511 | Medical Laboratories |
| | | 621512 | Diagnostic Imaging Centers |
| 8731 | Commercial Physical And Biological Research | 541710 | Research and Development in the Physical, Engineering and Life Sciences |
| 8732 | Commercial Economic, Sociological, & Educational Research | 541720 | Research and Development in the Social Sciences and Humanities |
| | | 541910 | Marketing Research and Public Opinion Polling |
| 8733 | Non Commercial Research Organizations | 541710 | Research and Development in the Physical, Engineering and Life Sciences |
| | | 541720 | Research and Development in the Social Sciences and Humanities |
| 8734 | Testing Laboratories | 541380 | Testing Laboratories |
| | | 541940 | Veterinary Services |

Source: MERIC

Importance

Building on Strength

Missouri has the 5th most diversified economy in the nation. This means the state's economy is remarkably similar to that of the nation as a whole in terms of the diversity of its industries and employment. The state has strengths in both traditional business sectors like tourism, finance and banking, agriculture and manufacturing as well as New Economy industries like Life Science, Information Technology and Advanced Manufacturing.

Within Life Science, Missouri has more industry concentration in Food and Kindred Products, Health Services, and Chemicals and Allied Products than other states.

| Missouri's Top 20 Export Industries (To Other States) | | |
|--|---------------------------------------|--------------------------|
| SIC Code | SIC Title | Location Quotient |
| 3100 | Leather and Leather Products | 2.30 |
| 1400 | Nonmetallic Minerals, except Fuels | 1.55 |
| 4800 | Communications | 1.50 |
| 2000 | Food and Kindred Products | 1.48 |
| 3700 | Transportation Equipment | 1.48 |
| 4000 | Railroad Transportation | 1.44 |
| 4200 | Trucking and Warehousing | 1.41 |
| 6200 | Security and Commodity Brokers | 1.30 |
| 2700 | Printing and Publishing | 1.29 |
| 5500 | Automotive Dealers & Service Stations | 1.27 |
| 2500 | Furniture and Fixtures | 1.26 |
| 5300 | General Merchandise Stores | 1.24 |
| 4300 | U.S. Postal Service | 1.23 |
| 8000 | Health Services | 1.23 |
| 1000 | Metal Mining | 1.19 |
| 2800 | Chemicals and Allied Products | 1.18 |
| 7900 | Amusement & Recreation Services | 1.15 |
| 8600 | Membership Organizations | 1.15 |
| 4900 | Electric, Gas and Sanitary Services | 1.13 |
| 3400 | Fabricated Metal Products | 1.12 |

Source: MERIC

Importance

Economic Impact

Life Science in Missouri

Direct Jobs:

170,000+

Indirect Jobs:

266,000

Direct Income:

\$6,700,000,000+

Indirect Income

\$9,700,000,000

Estimated Contribution to State Economy

\$23,000,000,000

13.5% of State Economy

(1996 Dollars)

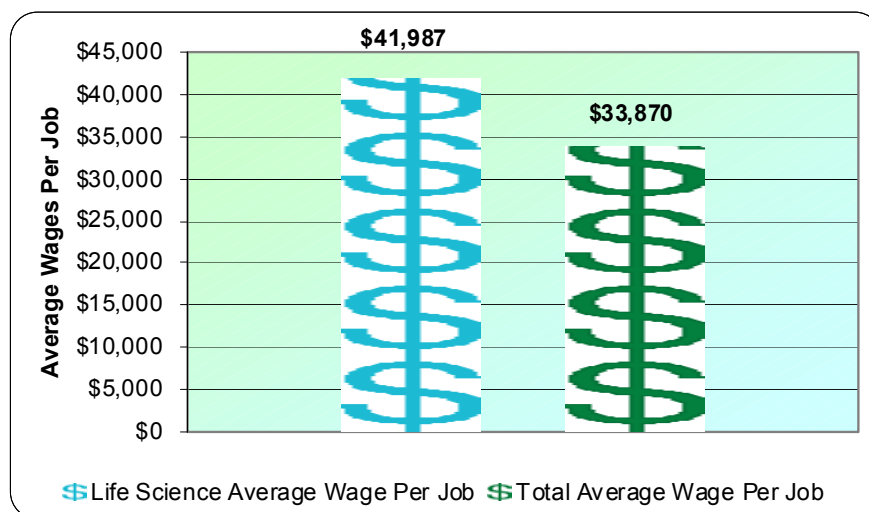
Sources: ES-202, Missouri Department of Economic Development, REMI

Importance

Better Fiscal Returns

The typical Life Science job pays 24% more than the statewide average wage. In 2002, the Life Science industry average wage was \$41,987 compared to the statewide average wage of \$33,870.

Life Science Wages



Source: MERIC

Better wages translate into more potential revenues for the state. For instance, the creation of 500 new Life Science jobs generates more than *six times* the amount of state revenue as a like amount of jobs created in retail.

State Fiscal Impact

(Assumes 500 Jobs Created for 8 Years)

| State Revenues & Costs | Life Science | Retail |
|----------------------------|---------------|---------------|
| Cumulative Revenues | \$5,115,585 | \$1,618,161 |
| Cumulative Expenses | (\$1,999,017) | (\$1,164,402) |
| Cumulative Benefit-Cost | \$3,116,568 | \$453,759 |
| Net Present Value Revenues | \$4,223,299 | \$1,325,928 |
| NPV Expenditures | (\$1,605,500) | (\$933,639) |
| NPV Benefit-Cost | \$2,617,800 | \$392,289 |

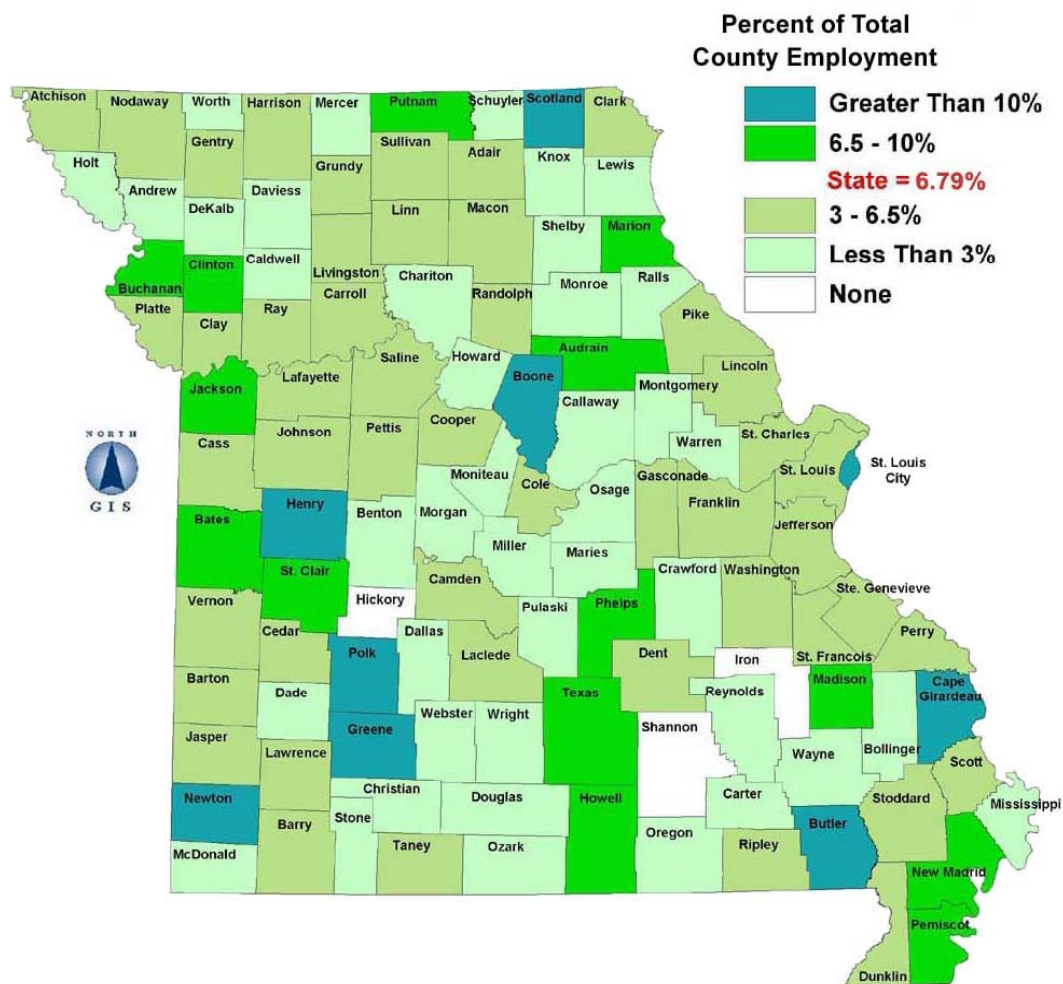
Source: REMI

Employment

Missouri Life Science Employment 2nd Quarter 2003

Through the first half of 2003 there were roughly 2,000 Life Science companies in Missouri. These companies employed 6.79% of the state's total workforce. Several counties in the state have a high concentration of life science employment including Boone, Cape Girardeau, Greene, Henry, and Newton, as well as St. Louis City.

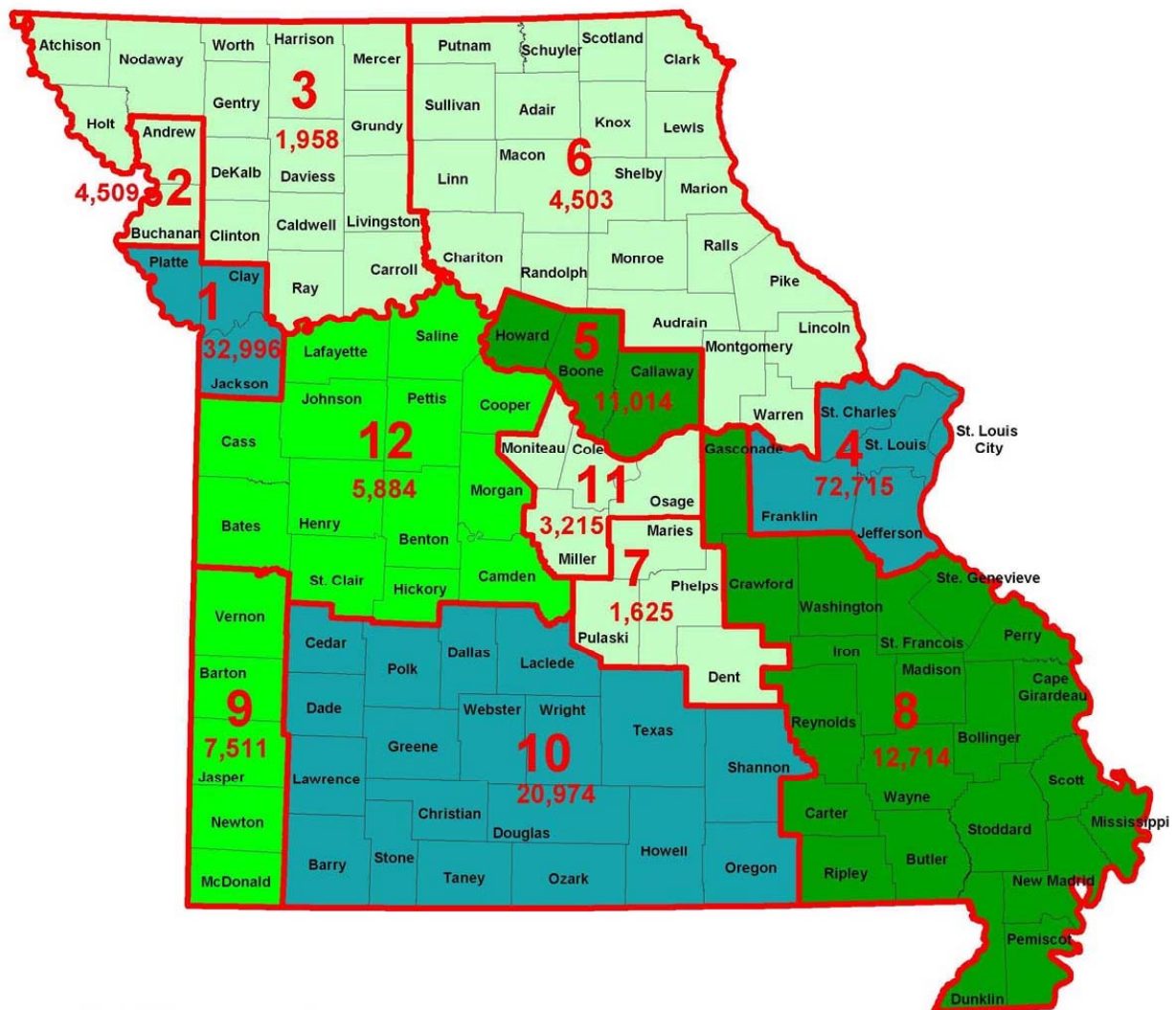
| Mo Total Employment | Life Science Employment | Life Science as % of Total Employment |
|---------------------|-------------------------|---------------------------------------|
| 2,644,542 | 179,618 | 6.79% |



Employment

Source: MERIC

Missouri Life Science Employment Distribution by Possible Life Science Districts 2nd Quarter 2003



Total Employment



Source: MERIC

Employment

Missouri Life Science Industry Distribution by Possible Life Science Districts 2nd Quarter 2003

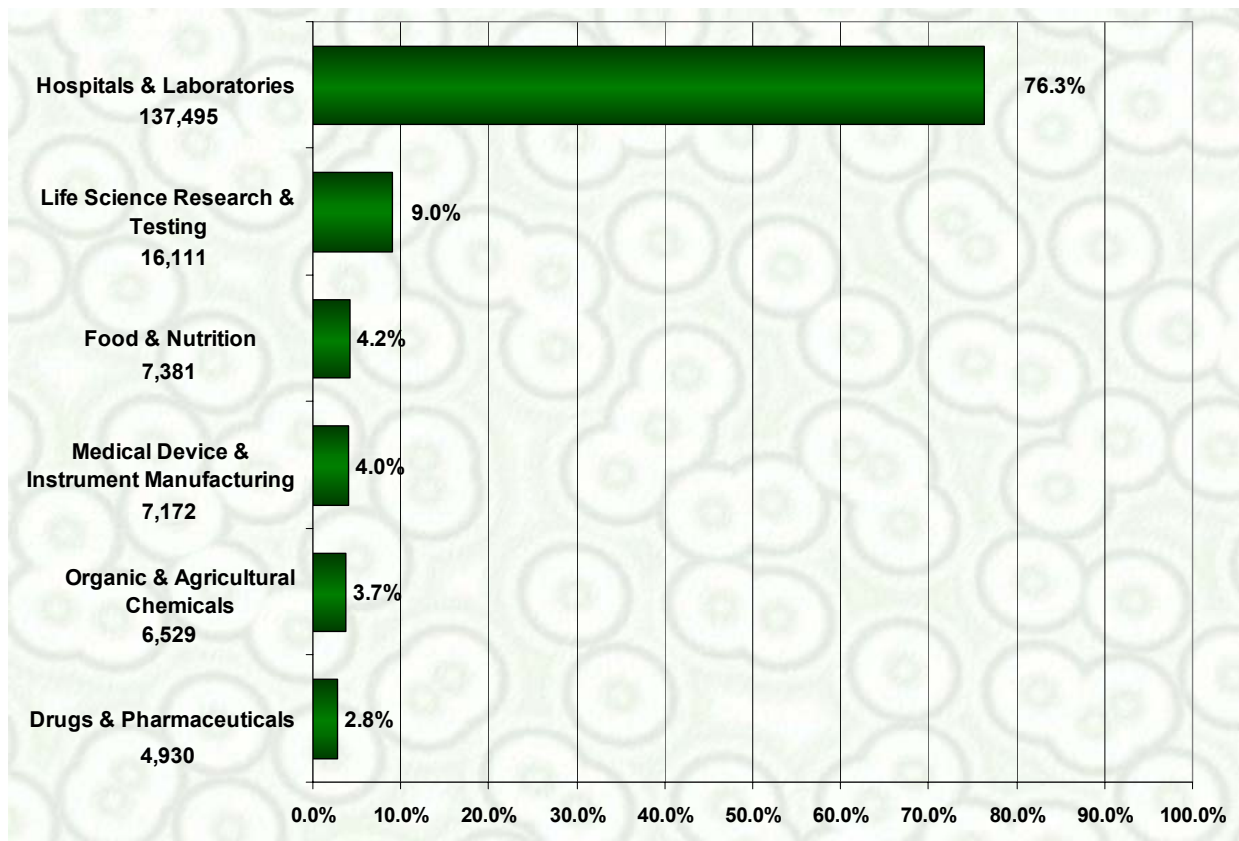
| District | Life Science Employment | % of Life Science Employment | Life Science Firms | % of Life Science Firms |
|-----------------|------------------------------------|---|-------------------------------|------------------------------------|
| 1 | 32,996 | 18.37% | 300 | 15.54% |
| 2 | 4,509 | 2.51% | 23 | 1.19% |
| 3 | 1,958 | 1.09% | 53 | 2.74% |
| 4 | 72,715 | 40.48% | 749 | 38.79% |
| 5 | 11,014 | 6.13% | 78 | 4.04% |
| 6 | 4,503 | 2.51% | 94 | 4.87% |
| 7 | 1,625 | 0.90% | 31 | 1.61% |
| 8 | 12,714 | 7.08% | 113 | 5.85% |
| 9 | 7,511 | 4.18% | 71 | 3.68% |
| 10 | 20,974 | 11.68% | 254 | 13.15% |
| 11 | 3,215 | 1.79% | 49 | 2.54% |
| 12 | 5,884 | 3.28% | 116 | 6.01% |

Source: MERIC

Employment

Missouri Life Science Employment by Subsector 2nd Quarter 2003

The vast majority of life science employment in the state is in the Hospitals and Laboratories subsector (76.3 percent). This subsector is comprised of general medical and surgical hospitals, psychiatric, substance abuse and specialty hospitals, as well as medical laboratories and diagnostic imaging centers.



Life Science subsectors based on "Life Sciences & Missouri's Economic Future: An Opportunity to Build One Missouri" Battelle Memorial Institute, January 2003.

Source: MERIC

Life Science Industry Trends

The Life Science Industry in Missouri has seen employment growth in the past few years, albeit at a lower rate than total state employment. While statewide employment has increased by 5.16 percent between 1996 and 2002, Life Science jobs grew by 3.7 percent. However, the rate of growth in Life Science employment has outstripped the state's since 2000.

Employment in Life Science

| | 1996-2002 |
|------------------|-----------|
| Life Science | 3.70% |
| Total Employment | 5.16% |

The growth of firms in the Life Science Industry has exceeded that of the state as a whole. Life Science firms grew by 8.13 percent between 1996 and 2002, while the total number of firms in the state increased by 7.62 percent.

Firms in Life Science

| | 1996-2002 |
|--------------|-----------|
| Life Science | 8.13% |
| Total Firms | 7.62% |

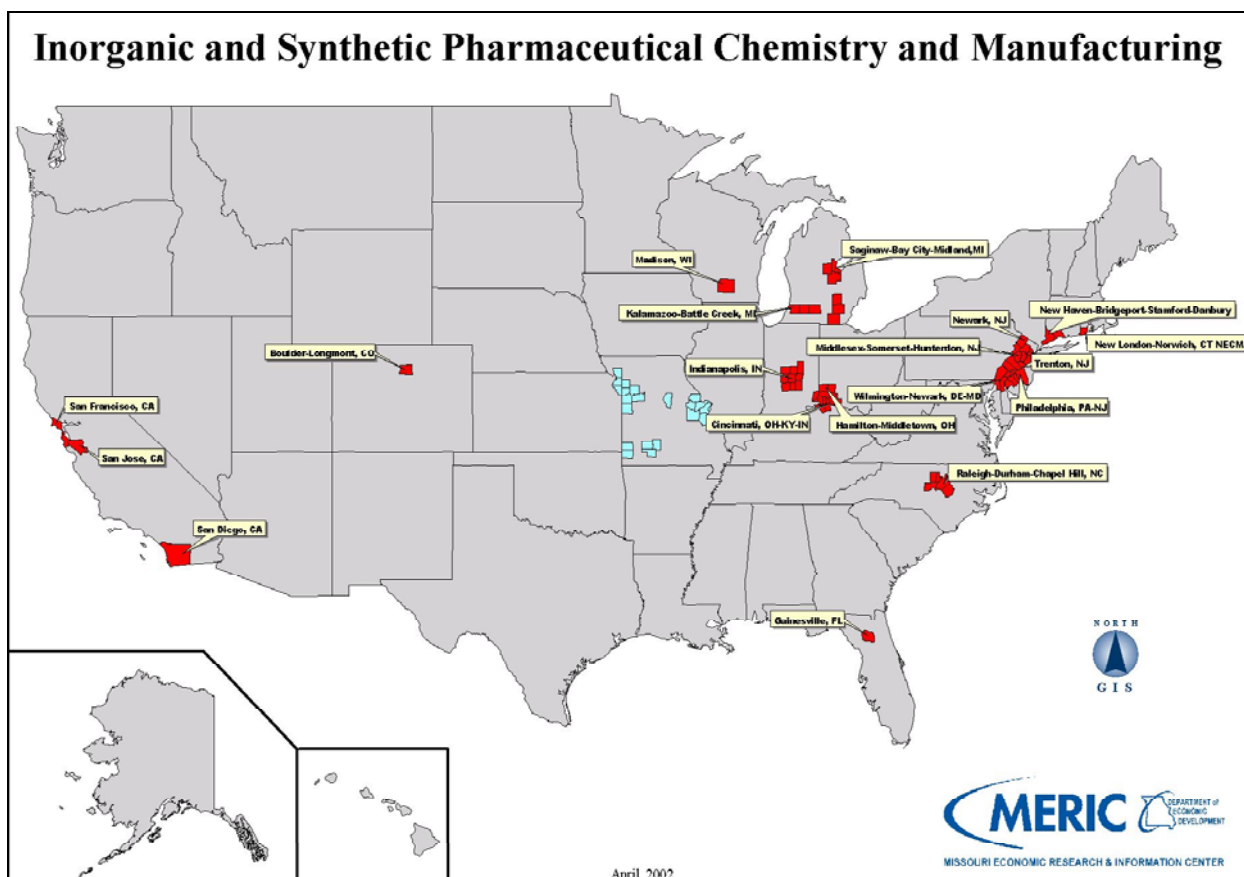
Top 20 Technology Classes by Patents Issued 1997 to 2001

Life Science represents four of the top five patent-producing technology classes in Missouri. Drugs, Organic Compounds, Molecular Biology and Microbiology, and Surgery are the top categories for patents issued to firms and organizations in the state between 1997 and 2001. In addition, nine of Missouri's top twenty technology classes for patents are life science based.

| Technology Class Title | Total Patents |
|---|---------------|
| 424 Drug, Bio-Affecting and Body Treating Compositions (includes Class 514) | 391 |
| 532 Organic Compounds (includes Classes 532-570) | 164 |
| 435 Chemistry: Molecular Biology and Microbiology | 152 |
| 128 Surgery (includes Class 600) | 88 |
| 310 Electrical Generator or Motor Structure | 72 |
| 428 Stock Material or Miscellaneous Articles | 72 |
| 222 Dispensing (apparatus and process) | 71 |
| 606 Surgery (instruments) | 63 |
| 800 Multicellular Living Organisms and Unmodified Parts Thereof and Related Processes | 54 |
| 137 Fluid Handling | 52 |
| 520 Synthetic Resins or Natural Rubbers (includes Classes 520-528) | 51 |
| 206 Special Receptacle or Package | 49 |
| 5 Beds | 48 |
| 426 Food or Edible Material: Processes, Compositions, and Products | 48 |
| 210 Liquid Purification or Separation | 46 |
| 340 Communications: Electrical | 45 |
| 73 Measuring and Testing | 41 |
| 504 Plant Protecting and Regulating Compositions | 41 |
| 604 Surgery (Medicators and Receptors) | 41 |
| 29 Metal Working | 39 |

Source: U.S. Patent Office

| Inorganic and Synthetic Pharmaceutical Chemistry and Manufacturing | | | |
|--|---|-----------|---|
| Class 423 | Chemistry of Inorganic Compounds | Class 546 | Organic Compounds -- Part of the Class 532-570 Series |
| Class 504 | Plant Protecting and Regulating Compositions | Class 548 | Organic Compounds -- Part of the Class 532-570 Series |
| Class 514 | Drug, Bio-Affecting and Body Treating Compositions | Class 549 | Organic Compounds -- Part of the Class 532-570 Series |
| Class 534 | Organic Compounds -- Part of the Class 532-570 Series | Class 558 | Organic Compounds -- Part of the Class 532-570 Series |
| Class 540 | Organic Compounds -- Part of the Class 532-570 Series | Class 560 | Organic Compounds -- Part of the Class 532-570 Series |
| Class 544 | Organic Compounds -- Part of the Class 532-570 Series | Class 564 | Organic Compounds -- Part of the Class 532-570 Series |



| Patent Rankings | | |
|--|---------------------|-------------------|
| Inorganic and Synthetic Pharmaceutical Chemistry and Manufacturing | Patents per 100,000 | # of 318 |
| Trenton NJ PMSA | 99.42 | 1 st |
| New London-Norwich CT NECMA | 74.61 | 2 nd |
| Middlesex-Somerset-Hunterdon NJ PMSA | 63.04 | 3 rd |
| Wilmington-Newark DE-MD PMSA | 58.28 | 4 th |
| Indianapolis IN MSA | 50.83 | 5 th |
| Gainesville FL MSA | 45.12 | 6 th |
| Ann Arbor MI PMSA | 36.92 | 7 th |
| Madison WI MSA | 31.19 | 8 th |
| Kalamazoo-Battle Creek MI MSA | 30.15 | 9 th |
| Philadelphia PA-NJ PMSA | 28.78 | 10 th |
| Missouri's MSAs | | |
| St. Louis MO-IL MSA | 13.30 | 26 th |
| Columbia MO MSA | 9.43 | 41 st |
| Kansas City MO-KS MSA | 2.97 | 94 th |
| Springfield MO MSA | 0.66 | 196 th |
| Joplin MO MSA | 0.00 | 277 th |
| St. Joseph MO MSA | 0.00 | 311 th |

Source: MERIC

Areas of Core Research Competencies in Missouri

| Area of Core Focus | Example of Applications | Key Strengths to Draw Upon | Leading Research Institutions Involved |
|---|---|--|--|
| Cross-Cutting Tools | | | |
| Genomics, Proteomics, and Bioinformatics | Ability to identify specific genetic mechanisms involved in human diseases and plant development | Molecular genetics Genome sequencing Structural biology Computational biology | Washington University UM-Kansas City Stowers Institute for Medical Research Danforth Center |
| Drug Design and Development | Improved drug solubility, stability and tissue targeting Pediatric drug treatments Drug design | Pharmaceutical chemistry Pharmacology | University of Kansas Washington University UM-Kansas City UM-Columbia Children's Mercy MRI |
| Bioengineering | Imaging, Adhesive dental composites, Bone repair and substitutes, Delivery of drugs and therapies | Tissue engineering Bone biology Material sciences Computational biology | Washington Univ., UM – Rolla, UM – Kansas City, MRI |
| Plant and Agriculture-Related Sciences | | | |
| Plant Sciences | Improved crop yields, resistance to disease and pests, and plant nutrition Unique focus on tropical (RH1) botany Improved human health through nutraceuticals, development of vaccines delivered in food, use of tropical plants for unique anti-cancer and anti-AIDS compounds, healthier meats, and research programs on herbal dietary supplements Industrial uses of plants including use of soybeans to create composites, oils, coatings, etc. | Genomics Proteomics Cell and development biology | UM-Columbia Donald Danforth Plant Science Center Washington University UM-Rolla Missouri Botanical Garden UM-St. Louis MRI |
| Animal Sciences | Animal nutrition, animal vaccines, productivity | Immunology Genomics Proteomics | UM-Columbia MRI |

| Area of Core Focus | Example of Applications | Key Strengths to Draw Upon | Leading Research Institutions Involved |
|---|--|--|--|
| Human Disease Treatment | | | |
| Neurological and Psychiatric Disorders and Injuries | Alzheimer's disease Multiple sclerosis Nerve growth factors Brain and spinal injuries Epilepsy Stroke Parkinson's disease | Neurology and neurobiology Imaging Cell biology Pharmacology Stem cell research | Washington University University of Kansas |
| Cardiovascular Diseases | Heart disease Hypertension Cystic fibrosis Renal failure | Cardiology Heart surgery Molecular biology Physiology | UM-Columbia Washington University Mid America Heart Institute in Kansas City |
| Infectious Diseases | HIV, hepatitis, yellow fever, herpes | Microbiology Immunology Virology Proteomics | Saint Louis University Washington University |
| Cancer Research | Bone marrow transplantation Radiopharmaceuticals Multiple cancer diseases | Human genetics Proteomics Cell biology Immunology Nuclear medicine Pharmacology | Washington University UM-Columbia University of Kansas Stowers Institute for Medical Research |
| Geriatric Research | Osteoporosis, arthritis, hypertension, prostate disease | Human genetics Immunology Proteomics Endocrinology | UM-Columbia University of Kansas Washington University |
| Environmental Technologies | | | |
| Environmental Protection | Bioremediation Ecological sustainability Biosensors Environmental controls Biological nutrient removal processes Integrated chemical/biological processes for water treatment | Environmental engineering Informatics Molecular biology | UM-Rolla UM-St. Louis Washington University MRI |
| Homeland Security | Chemical, biological, and radiological detection Hazard marking Natural disaster recovery Demining Modeling, simulations and analysis Training | Bioengineering | Ft. Leonard Wood UM-Rolla Saint Louis University MRI |

Source: Battelle Memorial Institute, "Life Sciences & Missouri's Economic Future: An Opportunity to Build One Missouri", January 2003.

Occupations

Top 20 Occupations Over 1,000 Employees with High Life Science Concentration

| Occupational Title | Percent of Employment in Life Science Industries | Projected Employment 2010 | Percent Change 2000-2010 | Average Annual Wage |
|---|--|---------------------------|--------------------------|---------------------|
| Respiratory Therapists | 94.34% | 2,740 | 33.66% | \$37,502 |
| Surgical Technologists | 86.73% | 1,950 | 25.00% | \$28,642 |
| Medical and Clinical Laboratory Technologists | 78.10% | 4,180 | 15.15% | \$40,518 |
| Separating, Filtering, Clarifying, Precipitating, and Still Machine Setters, Operators, and Tenders | 74.09% | 1,100 | 0.00% | \$26,894 |
| Radiologic Technologists and Technicians | 69.58% | 4,250 | 18.72% | \$35,734 |
| Chemical Equipment Operators and Tenders | 67.67% | 1,850 | 16.35% | \$37,190 |
| Chemists | 67.66% | 1,500 | 9.49% | \$51,126 |
| Psychiatric Aides | 66.61% | 2,980 | 8.76% | \$20,426 |
| Chemical Plant and System Operators | 66.27% | 1,080 | 5.88% | \$37,315 |
| Interviewers, Except Eligibility and Loan | 62.28% | 4,150 | 24.25% | \$22,506 |
| Registered Nurses | 60.57% | 59,990 | 18.53% | \$43,347 |
| Mixing and Blending Machine Setters, Operators, and Tenders | 59.84% | 4,690 | 5.39% | \$30,222 |
| Physical Therapist Assistants | 55.16% | 1,560 | 25.81% | \$35,547 |
| Healthcare Support Workers, All Other | 54.92% | 2,100 | 17.32% | \$23,421 |
| Medical and Clinical Laboratory Technicians | 52.62% | 4,680 | 10.64% | \$25,688 |
| Medical Secretaries | 50.70% | 6,710 | 6.34% | \$22,443 |
| Chemical Technicians | 49.56% | 1,230 | 7.89% | \$41,267 |
| Medical and Public Health Social Workers | 49.50% | 3,220 | 22.90% | \$37,336 |
| Dietitians and Nutritionists | 49.22% | 1,080 | 5.88% | \$37,315 |
| Health Professionals and Technicians, All Other | 47.06% | 2,090 | 15.98% | \$27,082 |

Source: MERIC

Occupations

| Top 20 Occupations Less than 1,000 Employees with High Life Science Concentration | | | | |
|---|--|---------------------------|--------------------------|---------------------|
| Occupational Title | Percent of Employment in Life Science Industries | Projected Employment 2010 | Percent Change 2000-2010 | Average Annual Wage |
| Biomedical Engineers | 100.00% | 150 | 15.38% | \$61,589 |
| Biochemists and Biophysicists | 100.00% | 360 | 24.14% | \$51,646 |
| Microbiologists | 100.00% | 210 | 0.00% | \$47,362 |
| Respiratory Therapy Technicians | 89.66% | 780 | 34.48% | \$28,621 |
| Survey Researchers | 89.23% | 320 | 23.08% | \$27,435 |
| Cardiovascular Technologists and Technicians | 78.45% | 760 | 31.03% | \$32,386 |
| Nuclear Medicine Technologists | 68.39% | 360 | 16.13% | \$47,486 |
| Medical Equipment Preparers | 67.26% | 700 | 12.90% | \$20,883 |
| Dental Laboratory Technicians | 66.34% | 870 | 22.54% | \$29,827 |
| Medical Appliance Technicians | 60.91% | 150 | 36.36% | \$28,912 |
| Agricultural and Food Science Technicians | 59.06% | 360 | 12.50% | \$35,027 |
| Radiation Therapists | 54.23% | 610 | 17.31% | \$45,344 |
| Occupational Therapist Aides | 53.75% | 190 | 18.75% | \$24,648 |
| Diagnostic Medical Sonographers | 52.11% | 1,060 | 17.78% | \$47,278 |
| Chemical Engineers | 52.00% | 920 | 8.24% | \$72,821 |
| Anthropologists and Archeologists | 50.00% | 50 | 25.00% | \$49,400 |
| Cleaning, Washing, and Metal Pickling Equipment Operators and Tenders | 45.56% | 230 | -14.81% | \$25,397 |
| Biological Technicians | 44.42% | 470 | 9.30% | \$32,698 |
| Physical Therapist Aides | 42.81% | 790 | 23.44% | \$21,570 |
| Economists | 42.31% | 590 | 13.46% | \$87,922 |

Source: MERIC



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